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Internal parasites of the mole (*Talpa europaea* L.) in the Lublin environment

Pasożyty wewnętrzne kreta (*Talpa europaea* L.) okolic Lublina

The present paper supplements the investigations of the helminthofauna of insectivorous mammals in Poland. The paper deals with internal parasites of moles (*Talpa europaea* L.) collected on the terrain of the Lublin palatinate.

Studies of the parasitic fauna of this group of hosts are conducted for long time on the terrain of Poland but in every case the number of the examined moles was very small.

In 1928 Serafiński in his paper makes only a hint on the parasitic fauna of this host. Łukasiak (1939) in his investigations of the helminthological fauna of Poland dealt actually only with four specimens of moles. Mention should be made of works of Sołtys (1952 — 1954) which studied the helminthofauna of insectivorous mammals, but his investigations were concentrated exclusively to the representatives of the family *Soricidae*, collected from the Białowieża National Park. Żarnowski (1955) studying the parasitic worms of small silvane mammals of the Puławy environment mentions only marginally the tapeworms of the mole whereby he examined 9 host individuals. Therefore the present investigations aim to give an inventory of the helminthofauna of the mole in Poland, based on a more numerous material.

The investigated material included 92 moles (*Talpa europaea* L.) collected in the course of several years. The greatest number of the material was collected in 1957. A part of the moles was collected on fields lying close to Lublin, another part — on fields situated near the forests of Puławy, and the remaining, main part

of the moles originated from the extensive meadows near Zamość.
The extensity of invasion is illustrated in Table I.

Table I
Extensity of invasion of moles

Host	Examined	Invaded	% of invasion	Trematoda		Cestoda		Nematoda	
				Exam.	%	Exam.	%	Exam.	%
<i>Talpa europaea</i>	92	32	53	2	2.1	4	4.3	26	28

The intensity of invasion by the separate species of parasites and the number of moles invaded by them are shown in the Table II.

Attention should be drawn to the fact that the parasitic fauna of the moles in comparison with the parasitofauna of other insectivorous mammals is very poor, particularly in respect to flukes and tapeworms.

A total number of six species of parasites were found.

Table II
Intensity of invasion by the separate parasitic species

Parasite	Invaded moles	Intensity
<i>Ithyogonimus talpae</i>	2	1—6
<i>Staphylocystis bacillaris</i>	4	1—7
<i>Spirura talpae</i>	2	1—8
<i>Morganiella talpae</i>	8	1—8
<i>Capillaria capillaris</i>	17	1—5
<i>Capillaria talpae</i>	1	1

The flukes were represented by a single species *Ithyogonimus talpae* (Goeze, 1782) found in two moles; the tapeworms were represented also by a single species *Staphylocystis bacillaris* (Goeze, 1782) Spassky, 1954, found in 4 moles; the nematodes, however, occurred in number of 4 species. Among them *Morganiella talpae* (Morgan, 1928) Travassos, 1937 and *Capillaria capillaris* (Linstow, 1882) Stiles et Stanley, 1932 were noted most commonly and most numerously.

As regards co-occurrence of various species of parasites in one host specimen it should be stressed, that absolutely no interrelationship was noted. Only in three cases the co-occurrence of two species of parasites was observed and in the remaining cases the invasion was caused by a single species whereby the intensity of the invasion was very small.

Because the species of parasites studied in the present work are on the whole very common and known, therefore in the description only brief data related to the separate species are presented. Particular attention is drawn to the *Nematodes* of the *Capillaria* genus, because practically there is a lack of their description in the literature and the identification of the species of this genus was not in every case possible.

Systematical part

TREMATODA

Brachylaemidae Stiles et Hassal, 1898

Ithyogonimus talpae (Goeze, 1782)

Syn.: *Fasciola talpae* Goeze, 1782; *Cucullanus talpae* (Goeze, 1782) Müller, 1787; *Cucullanus ocreatus* Schrank, 1783; *Monostoma ocreatum* (Schrank, 1783) Zeder, 1800; *Distoma ocreatum* (Schrank, 1783) Dujardin, 1845; *Distoma lorum* Melnikow, 1865; *Dolichosomum lorum* (Melnikow, 1865) Looss, 1899; *Ithyogonimus lorum* (Melnikow, 1865) Looss, 1907.

In my material *Ithyogonimus talpae* (Goeze, 1782) was found in the small intestine. There were 1—6 specimens in 2 moles in the total number of 92 examined moles. The general dimensions of the flukes found by me (14—28 mm length and 0.42—0.72 mm width) were greater than the dimensions of the body of the flukes reported hitherto in the literature.

CESTODA

Hymenolepididae Fuhrmann, 1907

Staphylocystis bacillaris (Goeze, 1872) Spassky, 1954

Syn.: *Taenia bacillaris* Goeze, 1782; *Hymenolepis bacillaris* (Goeze, 1782) Linstow, 1904; *Dicranotaenia bacillaris* (Goeze, 1782) Lopez-Neyra, 1942; Skrjabin et Mathevossian, 1945, 1948.

One to seven specimens of this tapeworm were found by me in the duodenum of 4 moles in the total number of 92 examined animals. The specimens did not differ in any way from descriptions found in the literature and totally corresponded to the characteristics of this species.

NEMATODA

Heligmosomatidae Cram, 1927*Morganiella talpae* (Morgan, 1928) Travassos, 1937

Syn.: *Viannaia talpae* Morgan, 1928; *Longistriata talpae* (Morgan, 1928) Schulz et Lubimow, 1932.

The nematodes found by me corresponded by their dimensions and morphological appearance totally to the characteristics of this species. Attention should be drawn to the habitat of this parasite. Hitherto, this parasite was found exclusively in the small intestine. In my material *Morganiella talpae* in number of 1—8 specimens were found in 8 moles, whereby they appeared in the stomach, small intestine and also in the large intestine.

Spiruridae Oerley, 1885*Spirura talpae* (Gmelin, 1790)

Syn.: *Ascaris talpae* Gmelin, 1790; *Ascaris strumosa* Froelich, 1791; *Fusaria convoluta* Zeder, 1803; *Spiroptera strumosa* (Froelich, 1791) Rudolphi, 1819; *Spirura talpae* (Gmelin, 1790) Blanchard, 1849; *Filaria strumosa* (Froelich, 1791) Schneider, 1866; *Filaria gastrofila* Müller, 1894.

In comparison with the reported descriptions of this species my material represents only differences in respect to the length of the body: male 7.5—9.0 mm, female 8.0—13 mm.

In my material I have found 1—8 specimens of this nematode in the stomach of two moles.

Capillariidae Neveu — Lemaire, 1936*Capillaria capillaris* (Linstow, 1882) Stiles et Stanley, 1932

Syn.: *Trichosoma capillaris* Linstow, 1882; *Capillaria linstowi* Travassos, 1914.

Because this species is not sufficiently well described in the present literature a detailed description based on the author's material is presented, especially as this nematode is a fairly common parasite of moles.

The nematodes are very thin and long, posteriorly the thickness of the body increases. In the male the posterior end of the body often spirally coiled. The structure of the oral apparatus simple.

Male: 9.4—12.6 mm in length, 0.062—0.083 mm in thickness. The oesophagus 4.4—5.8 mm long; the number of glandular cells of

the oesophagus fluctuates within the limits of 45—50. The ratio between the length of the oesophagus to the length of the body is as 1 : 2 — 1 : 2.2. The spicule strongly chitinous, clearly visible; its length 0.94—1.05 mm. The proximal end of the spicule dilated and spherical with an insignificant cavity in the central line. The

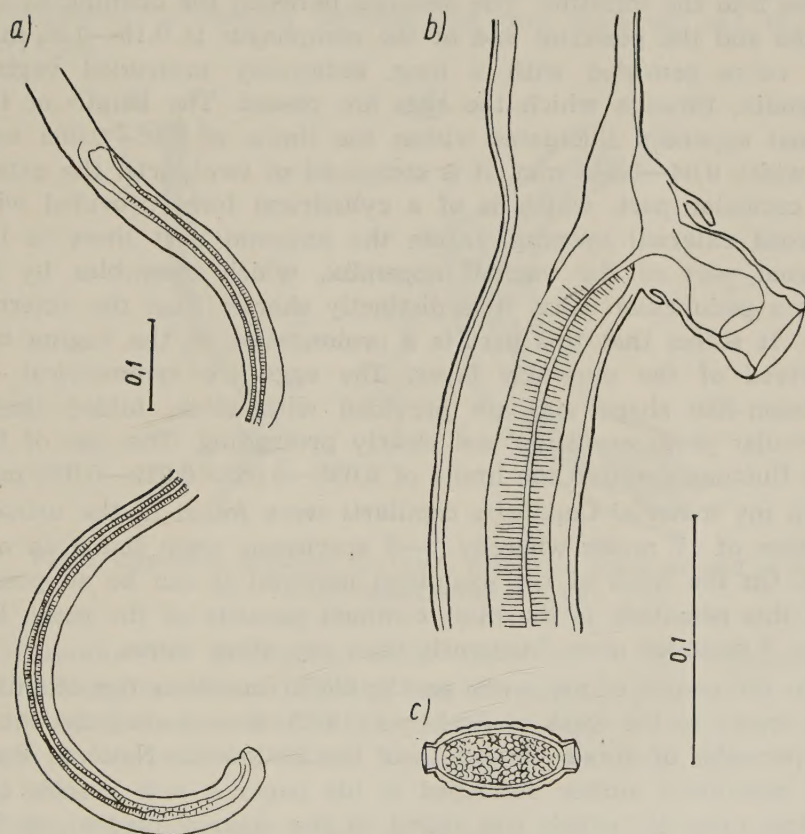


Fig. 1. *Capillaria capillaris* (Linstow, 1882) Stiles et Stanley, 1932.

a — posterior end of male; b — vulvar region; c — egg.

distal end terminates sharply. Spicular sheath unarmed, very finely notched on its whole length. The notches appear most distinctly in its half length. The length of the spicular sheath 1.15—1.17 mm. The caudal section of the male insignificantly dilated, transversally cut; no bursa copulatrix was observed by me.

Female: 12—17 mm in length, 0.091—0.116 mm in thickness. The oesophagus simple 5.8—6.72 mm in length. The number of cells of the oesophagus fluctuates within the limits of 48—55. The ratio between the length of the oesophagus to the length of the body is as 1:2—1:2.5. The vaginal pore appears in the anterior part of the body, somewhat posteriorly from the place the oesophagus passes into the intestine. The distance between the opening of the vagina and the posterior end of the oesophagus is 0.19—0.28 mm. The vulva provided with a long, externally protruded vaginal appendix, through which the eggs are passed. The length of the vaginal appendix fluctuates within the limits of 0.06—0.065 mm, the width 0.04—0.045 mm. It is composed of two parts; the external cuticular part, which is of a cylindrical form provided with a broad external opening. Inside the external part there is the internal part of the vaginal appendix, which resembles by its form a peduncular calix. It is distinctly shorter than the external part. It seems that this part is a prolongation of the vagina but deprived of the muscular layer. The eggs are symmetrical, of a lemon-like shape and are provided with thick, folded shells. Opercular plugs are large and clearly protruding. The size of the eggs fluctuates within the limits of $0.058\text{--}0.062 \times 0.029\text{--}0.032$ mm.

In my material *Capillaria capillaris* were found in the urinary bladder of 17 moles whereby 1—5 specimens were found in one host. On the basis of the examined material it can be supposed, that this nematode is the most common parasite of the mole, because it occurred more frequently than any other worm.

In the course of my work on *Capillaria capillaris* my attention was drawn to the work of Sołtys (1952), who studied the internal parasites of *Sorex araneus* L. of the Białowieża National Park. The mentioned author described in his paper a new species *Capillaria urinicola* which was found in the urinary bladder of *Sorex araneus*. In his subsequent paper on the helminthofauna of *Soricidae* of the Białowieża National Park the same author (Sołtys, 1954) made comparative studies with other descriptions of *Capillaria capillaris* and therefore he stated that the species *Capillaria urinicola* Sołtys, 1952, is synonym of *Capillaria capillaris* (Linstow, 1882) Stiles et Stanley, 1932. In Skrjabin's textbook: „Osnovy nematologii”, VI, 1957, dealing with *Trichocephalidae* and *Capillariidae*, *Capillaria urinicola* is mentioned among the synonyms of *Capillaria capillaris*. Thanks to the

offer of Doctor Sol'tys I received for comparative studies a certain number of specimens of nematodes, which were by him described initially as *C. urinicola* and subsequently classified as *C. capillaris*. Because my material found in the urinary bladder of moles represented undoubtedly specimens of *Capillaria capillaris*. I noticed in my comparative investigations that there are fundamental differences between my own material and that of Sol'tys.

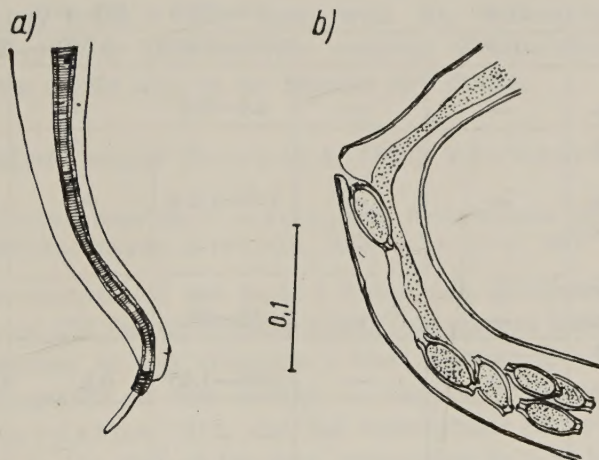


Fig. 2. *Capillaria urinicola* Sol'tys, 1952. a — posterior end of male; b — vulvar region. After Sol'tys, 1952.

Generally the differences refer above all to the dimensions of the body, number of cells of the oesophagus, presence or lack of the vaginal appendix in the female, length of the spicules, shape of the posterior end of the body of the male, size of the eggs etc.

Table III shows the details as regards differences between the two species. The table was arranged following comparative studies of my own data and descriptions of other authors.

Analysis of the above data shows that the separateness of the two species cannot be denied and therefore *Capillaria urinicola* Sol'tys, 1952 should be regarded as a separate species.

Beside the above mentioned species of nematodes of this genus which appear in the urinary bladder of insectivorous mammals there are in the literature reports on the existence of *Capillaria incrasata* (Diesing, 1851) Travassos, 1915; this species is

Table III
Comparative data of *Capillaria capillaris* and *Capillaria urinicola*

	Measurements	<i>Capillaria capillaris</i> after Freitas et Lent (1936)	<i>Capillaria capillaris</i> after Łukasiak (1939)	<i>Capillaria capillaris</i> after author	<i>Capillaria urinicola</i> after Soltys (1954)	<i>Capillaria urinicola</i> (Soltys' material, my measurements)
Male	Length	11.8	—	9.4—12.6	5.5—6.0	7.3—7.7
	Width	0.072	—	0.062—0.085	0.050	0.045—0.062
	Width of oesophagus	—	—	4.4—5.8	—	3.3—3.78
	Ratio betw. length of oesophagus to length of body	—	—	1:2—1:2.2	—	1:2—1:2.2
	No. of oesophageal cells	—	—	45—50	—	28—35
	Length of spicule	0.81	—	0.94—1.05	0.8	0.79—0.92
	Length of spicular sheath	—	—	1.15—1.17	—	—
	Length	—	7.49—10.8	12.0—17.0	10.7—10.8	5.6—7.7
Female	Width	0.140	0.085	0.091—0.116	0.06	0.062—0.07
	Length of oesophagus	—	—	5.8—6.72	—	3.0—3.5
	Ratio betw. length of oesophagus to length of body	—	—	1:2—1:2.5	—	1:2—1:2.5
	No. of oesophageal cells	—	—	48—55	—	32—38
	Vaginal pore from posterior end	4.5	—	6.0—10.0	5.5—6.0	2.8—4.25
	Length of vaginal appendix	present	—	0.06—0.065	absent	absent
	Eggs	49 × 26 μ	56 × 27 μ	58-62 × 24-29 μ	50 × 25 μ	50 × 25 μ

a parasite living in the urinary bladder of *Sorex araneus* L. Because *Capillaria urinicola* Soltyś, 1952 was found in the urinary bladder of the same host the problem of separateness of the two species *Capillaria urinicola* and *Capillaria incrasata* arises. Comparing the incomplete data concerning the dimensions and structure of the posterior end of the body of the male *Capillaria incrasata* (according to Freitas et Lent, 1936: Male length of the body 10.4 mm, width 0.062 mm — 0.106 mm, length of spicule 0.88 mm. Female: 14.2 mm length, 0.078—0.16 mm width, size of eggs 0.065×0.025 mm) with the corresponding dimensions of *Capillaria urinicola*, the problem of separateness of these two species seems also to be beyond any doubt.

Capillaria talpae (Siebold, 1850) Travassos, 1915

Syn.: *Trichosomum* sp. Creplin, 1845; *Nematoideum talpae* Siebold, 1850; *Trichosoma talpae* (Siebold, 1850) Linstow, 1878.

In the stomach of one mole I found one specimen of a female nematode of the family *Capillariidae*. The present literature records the occurrence in the alimentary tract (intestine) of the mole of only one species of this family — *Capillaria talpae* (Siebold, 1850) Travassos, 1915, and the descriptions of its characteristic is limited to the size of the eggs (according to Siebold 0.072×0.034 mm; according to Galli — Valerio 0.072×0.030 mm).

In the absence of other data concerning this species the problem of its identification becomes serious and it is reasonable to doubt if there is such a separate species. However, because the form and dimensions of the eggs of the only one female found by me are very similar to the dimensions cited above, it seems to me, that I might have dealt with this species and therefore on this basis I classified it as *Capillaria talpae*. At the same time I am presenting my own description of the female found by me:

The length of the body 5.88 mm, maximal thickness 0.050 mm. the length of the oesophagus composed of 38 cells is 2.31 mm. The ratio between the length of the oesophagus and the length of the body is 1:2.5. The vaginal opening appears in the anterior part of the body, 0.04 mm posteriorly to the passage of the oesophagus into the intestine. Vaginal appendix absent. The muscular layer of the vagina not well developed and not clearly visible. In the uterus not many eggs. The anal opening situated subterminally. Asym-

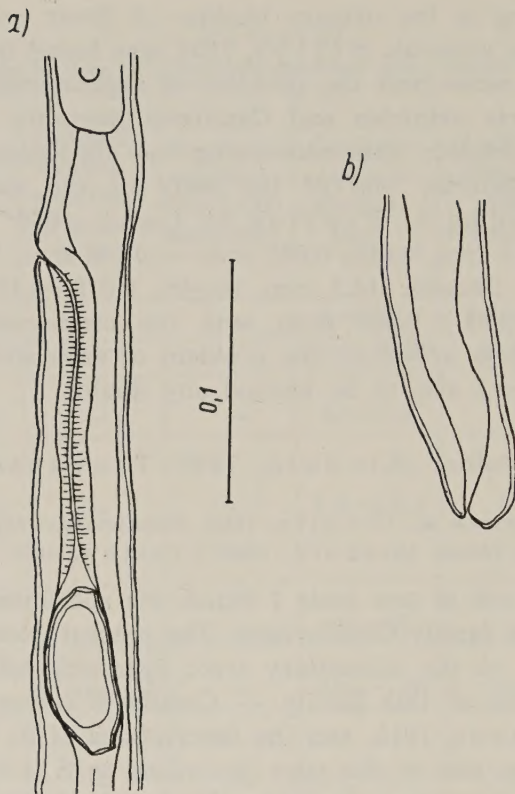


Fig. 3. *Capillaria talpae* (Siebold, 1850) Travassos, 1915. a — vulvar region; b — posterior end of female. Orig.

metric eggs are of lemon-like shape and are provided with a smooth, not too thick shell. One side of the eggs is straight or slightly concave, the opposite — convex. The size of eggs fluctuates within the limits $0.064\text{--}0.068 \times 0.026\text{--}0.032$ mm. One egg measured 0.099×0.026 mm.

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STRESZCZENIE

Autor przebadiał 92 krety (*Talpa europae* L.) łowione na terenie woj. lubelskiego.

Ogólny procent zarobaczenia kretów jest mały, na ogólną liczbę 92 zbadanych, zarażone były 32 egz., tj. 35%.

Ekstensywność inwazji ilustruje tabela I. Intensywność inwazji poszczególnymi gatunkami, oraz ilość zarażonych nimi kretów przedstawia tabela II.

Autor zwraca uwagę na fakt, że fauna pasożytnicza kretów w porównaniu z parazytofauną innych ssaków owadożernych jest bardzo uboga, szczególnie w odniesieniu do przywr i tasiemców.

Ogółem stwierdzono 6 gatunków pasożytów, przy czym spośród przywr występował wyłącznie gatunek *Ithyogonimus talpae* (Goeze, 1782) stwierdzony u dwóch kretów; spośród tasiemców — również jeden gatunek, *Staphylocystis bacillaris* (Goeze, 1782) Spassky, 1954 u czterech kretów; natomiast nicienie występowały najliczniej, mianowicie 4 gatunki, spośród których *Morganiella talpae* (Morgan, 1928) Travassos, 1937, oraz *Capillaria capillaris* (Linstow, 1882) Stiles et Stanley, 1932 notowane były najczęściej i najliczniej.

W części szczegółowej pracy autor ogranicza się wyłącznie do podania jedynie bardzo krótkich danych odnośnie poszczególnych gatunków. Natomiast zwraca szczególną uwagę na nicienie z rodzaju *Capillaria* i podaje dokładne opisy gatunków tego rodzaju stwierdzonych u badanych żywicieli, ponieważ brak jest w literaturze wyczerpujących opisów na podstawie których można by w każdym przypadku przeprowadzić indentyfikację gatunków tego rodzaju. W dalszym ciągu pracy autor, dysponując odpowiednim materiałem porównawczym, przeprowadza analizę różnic między *Capillaria urinicola* Sołtys, 1952 [uznaną później przez tego samego autora (Sołtys, 1954) za synonim *Capillaria capillaris* (Linstow, 1882) Stiles et Stanley, 1932] a *Capillaria capillaris* s. str. stwierdzoną w pęcherzu moczowym kretów i dochodzi do przekonania, że kwestia odrębności tych gatunków nie ulega wątpliwości. Dane dotyczące różnic między tymi gatunkami zawiera tabela III. Na podstawie wyników tych badań autor przywraca istnienie *Capillaria urinicola* Sołtys, 1952, jako odrębnego gatunku.